

RESEARCH LETTER

Geriatric antibody response to COVID-19

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INTRODUCTION

Studies on COVID-19 immune responses suggest antibody production begins around day 5 after symptom onset with 78%–100% of patients producing antibodies.^{1–6} Recent studies suggest antibody production is positively correlated with disease severity with more mild or asymptomatic cases producing lower antibody titers.^{7,8} Although older age and multiple comorbidities are associated with worse COVID-19 health outcomes, it is important to consider individual comorbid factors and how they impact immune response. The purpose of this study was to (1) determine the incidence of detectable antibody response in a long-term care facility (LTCF) population and (2) characterize the relationships between immune response, individual characteristics, and disease progression. We examined the IgG antibody response in geriatric residents of an LTCF 4 weeks after initial infection, 3 months postinfection, and 6 months postinfection.

METHODS

The antibody response of 49 COVID-19-positive residents of a 98-bed LTCF in West Virginia was tracked over time. Informed consent was documented for each resident or their medical power of attorney (WVU IRB Protocol #2006023468).

The primary outcome of interest was IgG antibody response, and all residents underwent antibody serology testing (IgG and IgM) 4 weeks after initial infection. If the antibody test was negative, the resident was considered a nonresponder. If positive, the resident was considered a responder and had repeat testing at 3 and 6 months postinfection. Demographic factors (age, race/ethnicity, and sex), medical conditions, and medications were retrospectively extracted from health record review. Patients' symptoms were grouped into asymptomatic, mild to moderate, or severe. Severe symptoms were defined as those that required oxygen supplementation beyond nasal cannula (i.e., non-rebreather, high-flow nasal cannula, bilevel positive airway pressure (BiPAP), or intubation).

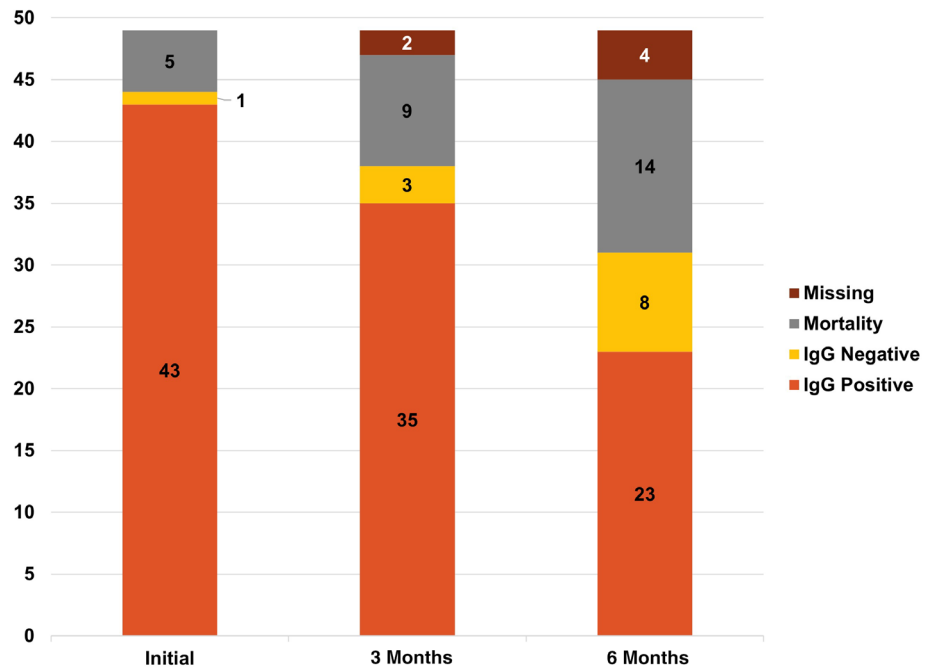
RESULTS

Residents were an average of 84 years of age, 77.5% female, and averaged seven chronic medical conditions, with dementia (69.4%) and heart disease (53.1%) being the most frequent (Table S1). The most common medications were antiplatelets (55.1%) and proton pump inhibitors (32.6%). About 10% were on an immune modulator (aromatase inhibitors, methotrexate, prednisone, and biologics). Overall, 59.2% of residents who tested positive were asymptomatic while 22.4% experienced severe symptoms.

Figure 1 displays the immune response in COVID-19-positive residents over 6 months of IgG testing. After initial antibody testing, 43 of 44 surviving

See related editorial by Ouslander et al and related articles by Mor et al, Rudolph et al, and Domi et al. in this issue.

FIGURE 1 Immune response of COVID-positive residents at an LTCF over 6 months



residents (97.7%) had a detectable IgG response; this was followed by 35 of 40 surviving residents (87.5%) at 3 months and 23 of 35 surviving residents (65.7%) at 6 months. The mortality rate in COVID-19-positive residents was 10.2% at 1 month, 18.4% at 3 months, and 28.6% at 6 months.

Only chronic kidney disease and use of an angiotensin receptor blocker were significantly associated with nonresponse in initial antibody testing. There were no significant associations between any factor and maintenance of antibodies at 3 or 6 months.

DISCUSSION

Our study tracked the immune response after COVID-19 infection in a cohort of older individuals living in an LTCF. We found that the vast majority of COVID polymerase chain reaction-positive individuals produced antibodies in response to infection. Only 2.3% of residents did not produce a detectable antibody response.

Past research into primary immune responses in geriatric populations indicates a decreased ability to produce antibodies. Our study suggests that the initial antibody response observed in this study is similar to current estimates in the general public in which 78%–100% developed antibodies following COVID infection.¹⁻⁵ This study supports current literature with respect to why there has been a very low recurrence rate in the general population to date; however, there are still reports of individuals having a recurrence of COVID-19.⁹ One theory attributes

this to the small number of individuals losing their antibodies or never developing them in the first place.

This study's major strengths are the sample size within the facility and the ability to closely track this closed population of older adults for 6 months. Limitations include only tracking the residents from one facility as well as our inability to track antibody titers; therefore, we cannot determine the robustness of individual immune responses nor analyze any change in antibody levels overtime.

Despite an average age of 84 years and seven comorbidities, the majority of the samples maintained an antibody response for at least 6 months. These results imply that a vaccine may produce similar results and therefore provide protection to most people, including adults in their 80s. Given that 34% of our sample lost their antibodies within 6 months, measures to protect individuals like them will still need to be in place.

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CONFLICT OF INTEREST

Dr Carl D. Shrader is the Medical Director of the LTCF described in this manuscript. He has no other financial or personal conflicts to disclose. Dr Courtney

S. Pilkerton, Dr Amie M. Ashcraft, Mr Joshua Moore, and Mr Tyler Groves have no financial or personal conflicts of interest to disclose.

AUTHOR CONTRIBUTIONS

Mr Joshua Moore and Mr Tyler Groves wrote the majority of the manuscript. Dr Courtney S. Pilkerton analyzed and interpreted the data and created the table and figure. Dr Amie M. Ashcraft assisted with editing and revising all sections of the manuscript. Dr Carl D. Shrader led data collection and provided mentorship on medical accuracy of the content. All authors contributed to study conception and design and also reviewed and approved the final manuscript.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

Table S1. Selected demographic characteristics and immune response of COVID-positive residents at an LTCF.

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